2-Year Expected Value Storm Event Lag Time Estimation - Proposed Condition SA UH

Nodes downstream of Node 118c (Developed Area)

U/S Node	D/S Node	U/S Drainage Area (acre)	D/S Drainage Area (acre)	U/S Lag Time	U/S Q (cfs)	Flow Length (feet)	U/S Elev. (feet)	D/S Elev. (feet)	Slope	Manning's N	Side Slope	Width (feet)	Flow Depth (feet)	Velocity (fps)	Travel Time (minutes)	Tc (minutes)	D/S Lag Time (hour)	D/S Q (cfs)	Q average (cfs)	Flow Depth (feet)	Velocity (fps)	Travel Time (minutes)	D/S Tc (minutes)	D/S Lag Time (hour)	D/S Q (cfs)	U/S Node	D/S Node
																							402.35					
118c	119/118C	48826	49495.7	5.365	540	532	347.47	341.63	0.01097	0.04	3		5.07	7.00	1.27	403.62	5.382	525	540	5.07	7.00	1.27	403.62	5.382	525	118c	119/118C
119	126	49496	50438.7	5.382	525	6204	341.63	286	0.00897	0.03	3		4.68	8.00	12.92	416.54	5.554	525	525	4.68	8.00	12.92	416.54	5.554	525	119	126
126	127	50439	52666	5.554	525	7191	286	240	0.0064	0.03	3		4.98	7.05	17.00	433.54	5.781	599	562	5.11	7.17	16.72	433.26	5.777	599	126	127
127	133u	52666	54418	5.777	599	4905	240	212	0.00571	0.03	3		5.35	6.98	11.71	444.97	5.933	639	619	5.41	7.04	11.62	444.88	5.932	639	127	33u
133u	133c	54418	61056	5.932	639	0	212	212	0.01	0.03	3		4.93	8.75	0.00	444.88	5.932	787	713	5.14	9.00	0.00	444.88	5.932	787	133u	133c

For nodes downstream of Node 118c, the flow rates based on single area UH model are used to estimate flow velocity and travel time.
The procedures include the following steps
1. Estimate upstream node flow rate using single area UH model.
2. Use upstream node flow rate to estimate travel time to downstream node.
3. Add the travel time to upstream Tc to get downstream Tc.
4. Use the downstream Tc to calculate downstream node flow rate using single area UH model.
5. Average flow rate is calculated based on upstream and downstream node flow rates.
6. Use the average flow rate to estimate travel time to downstream node.
7. Add the travel time to upstream Tc to get downstream Tc.

2-Year Expected Value Storm Event Lag Time Estimation
Other tributary area and node

Node 12606 - 126.1 (s26.1)
2-year EV flow rate
8 cfs at node 604
Total drainage area is:
31.5 acres at node 604
Unit Yield 0.2539683 (cfs/acre)

Longest flowpath from node 600

				Flowrate based on Unit Yield														
U/S Node	D/S Node	U/S Area	D/S Area	U/S Q per Yield	D/S Q per Yield	Average Q	Flow Length	U/S Elev.	D/S Elev.	Slope	Manning's N	Side Slope	Flow Depth	Velocity	Travel Time	Tc	U/S Lag Time	UH Single Area Model	
		(acre)	(acre)	(cfs)	(cfs)	(cfs)	(feet)	(feet)	(feet)				(feet)	(fps)	(minutes)	(minutes)	(hour)	U/S Q	D/S Q
603	604															17.05	0.23		
604	605	31.5	48.4	8	12	10	2571	455.0	325.0	0.051	0.013	1	0.91	12.14	3.53	20.58	0.27		
605/12601	12603	49558.2	49800.6	12586	12648	12617	1690	325.0	310.0	0.009	0.030	3	15.44	17.65	1.60	22.18	0.30		
12603	12604	49800.6	49802.2	12648	12648	12648	460	310.0	307.0	0.007	0.030	3	16.37	15.73	0.49	22.66	0.30		
12604	12605	49802.2	49817.6	12648	12652	12650	428	307.0	305.0	0.005	0.030	3	17.43	13.88	0.51	23.18	0.31		
12605	12606	49817.6	50405.8	12652	12801	12727	2159	305.0	286.0	0.009	0.030	3	15.51	17.63	2.04	24.22	0.32		

Local Rain Node 12606 - 126.1 (s26.1)
2-year EV flow rate
4.93 cfs at node 603.1
Total drainage area is:
31.5 acres at node 604
Unit Yield 0.1565079 (cfs/acre)

Longest flowpath from node 600

				Flowrate based on Unit Yield														
U/S Node	D/S Node	U/S Area	D/S Area	U/S Q per Yield	D/S Q per Yield	Average Q	Flow Length	U/S Elev.	D/S Elev.	Slope	Manning's N	Side Slope	Flow Depth	Velocity	Travel Time	Tc	U/S Lag Time	UH Single Area Model	
		(acre)	(acre)	(cfs)	(cfs)	(cfs)	(feet)	(feet)	(feet)				(feet)	(fps)	(minutes)	(minutes)	(hour)	U/S Q	D/S Q
603.1																17.85	0.24		
603.1	606	46.3	161.6	7	25	16	4973	598.0	325.0	0.055	0.013	1	1.07	14.09	5.88	23.73	0.32		
606/12601	12603	49671.4	49918.0	7774	7813	7793	1690	325.0	310.0	0.009	0.030	3	12.89	15.64	1.80	25.53	0.34		
12603	12604	49918.0	49920.5	7813	7813	7813	460	310.0	307.0	0.007	0.030	3	13.67	13.94	0.55	26.08	0.35		
12604	12605	49920.5	49936.3	7813	7815	7814	428	307.0	305.0	0.005	0.030	3	14.55	12.31	0.58	26.66	0.36		
12605	12606	49936.3	50525.0	7815	7908	7861	2159	305.0	286.0	0.009	0.030	3	12.95	15.63	2.30	27.84	0.37		

Notes:
The rational method model doesn't apply to the nodes downstream where the rainfall intensity is lower than the infiltration rate.
Travel time based on unit yield is added to the Tc of nodes to get downstream node Tc.
Unit yield method required in natural areas (0% impervious). For areas with any imperviousness, use rational method longest flowpath tc, not unit loss calc.
Don't need all channel nodes after message IF channel geometry remains same (slope, manning's n, side slope). If same geometry for all channels, can skip straight to node at end of subarea.
Need separate calc for anything going through a basin. But typically area entering basin has imperviousness, so that wouldn't apply.
One calc per each subarea, following longest flowpath (flowpath with HW node in ploss Hgraph summary sheet)
If there is a peak flow rate table at the node before the message, use tc for desired headwater, and rational method selected Q. If no peak flow table, use tc selected by rational method.
Use total area at each node - even if there is a confluence or code 8 sheet flow that wouldn't technically travel in the channel the whole way. This is more conservative.

5-Year Expected Value Storm Event Lag Time Estimation

5-year EV flow rate at La Novia based on frequency analysis is:
2940 cfs
Total drainage area is:
69532 acres
Unit Yield 0.042283 (cfs/acre)

Nodes upstream of Node 118c (Natural Area)

				Flowrate based on Unit Yield													
U/S Node	D/S Node	U/S Area (acre)	D/S Area (acre)	U/S Q per Yield (cfs)	D/S Q per Yield (cfs)	Average Q (cfs)	Flow Length (feet)	U/S Elev. (feet)	D/S Elev. (feet)	Slope	Manning's N	Side Slope	Flow Depth (feet)	Velocity (fps)	Travel Time (minutes)	Tc (minutes)	U/S Lag Time (hour)
101u																113.17	1.51
101c																113.17	1.51
103																115.44	1.54
104																121.18	1.62
10640	106	10443.6	12502	442	529	485	2254	1444	1320	0.0550	0.06	3	4.19	9.21	4.08	139.58	1.86
106	108	12502	16599	529	702	615	12951	1320	961	0.0277	0.06	3	5.21	7.56	28.56	143.66	1.92
108	113	16599	23614	702	998	850	10867	961	679	0.0260	0.05	3	5.56	9.17	19.76	172.22	2.30
113	114	23614	25186	998	1065	1032	2070	679	652	0.0132	0.05	3	6.79	7.46	4.63	191.98	2.56
114	115	25186	31889	1065	1348	1207	17899	652	436	0.0120	0.04	3	6.74	8.87	33.65	196.60	2.62
115	118u	31889	32917	1348	1392	1370	8745	436	347	0.0101	0.04	3	7.29	8.58	16.98	230.25	3.07
118c																247.23	3.30

For natural area upstream of Node 118c, Unit Yield method is used to estimate lag time.
The procedures include the following steps.
1. Flow rates based on unit yield are estimated for upstream and downstream nodes
2. Average flow rate is calculated from upstream and downstream nodes flow rates.
3. Average flow rate is used to estimate the travel time between upstream and downstream nodes.
4. Travel time is added to upstream Tc to get the downstream Tc.

Notes:
Node 10640 is the rational method node. The rational method model doesn't apply to the nodes downstream of Node 10640 because the rainfall intensity is lower than the infiltration rate.
Travel time based on unit yield is added to the Tc of node 10640 to get downstream node Tc.
The lag time for Node 101u, 101c, 103, and 104 are based on rational method model.

5-Year Expected Value Storm Event Lag Time Estimation - Proposed Condition SA UH

Nodes downstream of Node 118c (Developed Area)

U/S Node	D/S Node	U/S Drainage Area (acre)	D/S Drainage Area (acre)	U/S Lag Time	U/S Q (cfs)	Flow Length (feet)	U/S Elev. (feet)	D/S Elev. (feet)	Slope	Manning's N	Side Slope	Width (feet)	Flow Depth (feet)	Velocity (fps)	Travel Time (minutes)	Tc (minutes)	D/S Lag Time (hour)	D/S Q (cfs)	Q average (cfs)	Flow Depth (feet)	Velocity (fps)	Travel Time (minutes)	D/S Tc (minutes)	D/S Lag Time (hour)	D/S Q (cfs)
																							247.23		
118c	119/118C	48826	49495.7	3.30	2414	532	347.47	341.63	0.01097	0.04	3		8.89	10.18	0.87	248.10	3.308	2407	2414	8.89	10.18	0.87	248.10	3.308	2407
119	126	49496	50438.7	3.31	2407	6204	341.63	286	0.00897	0.03	3		8.28	11.71	8.83	256.93	3.426	2380	2407	8.28	11.71	8.83	256.93	3.426	2380
126	127	50438.7	52666	3.43	2380	7191	286	240	0.0064	0.03	3		8.78	10.29	11.65	268.59	3.581	2475	2428	8.85	10.34	11.60	268.53	3.580	2475
127	133U	52666	54418	3.58	2475	4905	240	212	0.00571	0.03	3		9.11	9.95	8.22	276.75	3.690	2540	2508	9.15	9.98	8.19	276.72	3.690	2540
133U	133c	54418	61056	3.69	2540	0	212	212	0.01	0.03	3		8.28	12.36	0.00	276.72	3.690	2789	2665	8.43	12.51	0.00	276.72	3.690	2789
133c	134u	61056	62747	3.69	2789	6461	212	173	0.00604	0.03	3		9.42	10.47	10.29	287.00	3.827	2822	2806	9.44	10.49	10.27	286.99	3.827	2822
134u	134c	62747	66607	3.83	2822	0	173	173	0.01	0.03	3		8.61	12.69	0.00	286.99	3.827	2903	2863	8.66	12.74	0.00	286.99	3.827	2903
134c	137	66607	67799	3.83	2903	6064	173	133	0.0066	0.03	3		9.41	10.93	9.24	296.23	3.950	2913	2908	9.41	10.94	9.24	296.23	3.950	2913
137	138	67799	69103	3.95	2913	4644	133	119.7	0.00286	0.03	3		11.02	8.00	9.67	305.90	4.079	2910	2913	11.02	8.00	9.67	305.90	4.079	2910
138	139	69103	69530	4.08	2910	3108	119.7	100	0.00634	0.03	3		9.49	10.78	4.81	310.71	4.143	2917	2914	9.49	10.78	4.80	310.70	4.143	2917
139		69530			2917																				

For nodes downstream of Node 118c, the flow rates based on single area UH model are used to estimate flow velocity and travel time.
The procedures include the following steps
1. Estimate upstream node flow rate using single area UH model.
2. Use upstream node flow rate to estimate travel time to downstream node.
3. Add the travel time to upstream Tc to get downstream Tc.
4. Use the downstream Tc to calculate downstream node flow rate using single area UH model.
5. Average flow rate is claculated based on upstream and downstream node flow rates.
6. Use the average flow rate to estimate travel time to downstream node.
7. Add the travel time to upstream Tc to get downstream Tc.

For the 2&5yr, even if no loss rate messages occur in the areas being studied, the message occurs upstream in the moutains of SJC, so all subsequent subareas must use unit yield.